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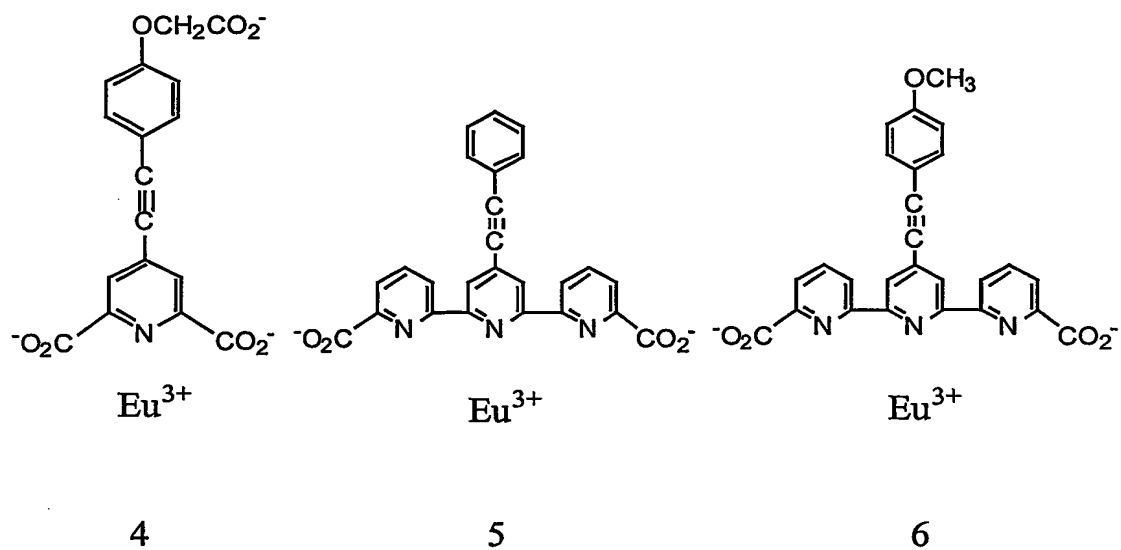
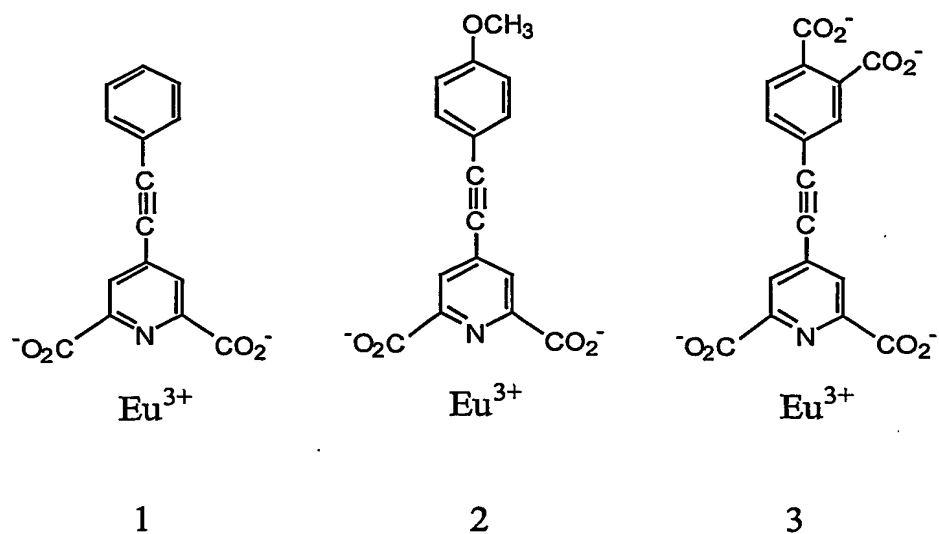
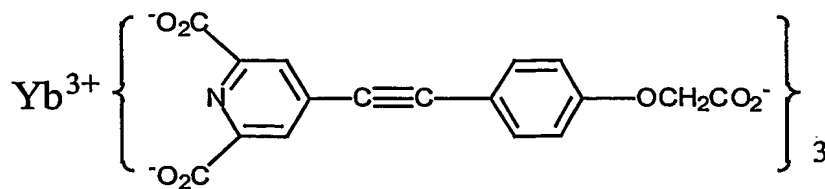


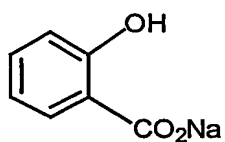
Figure 1

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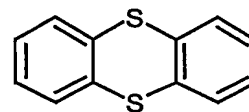
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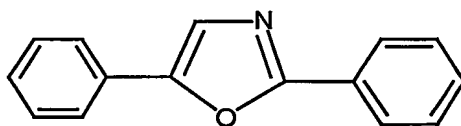
Ytterbium Chelate



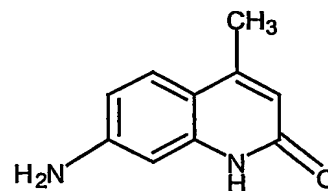
Sodium salicylate



Thianthrene



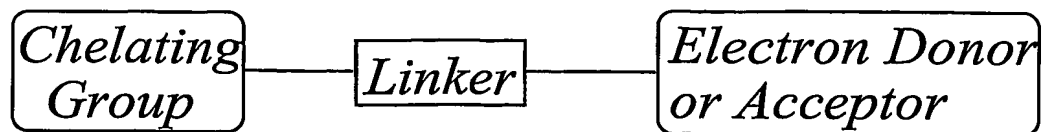
Diphenyloxazole



Carbostryl 124

Figure 2

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Example

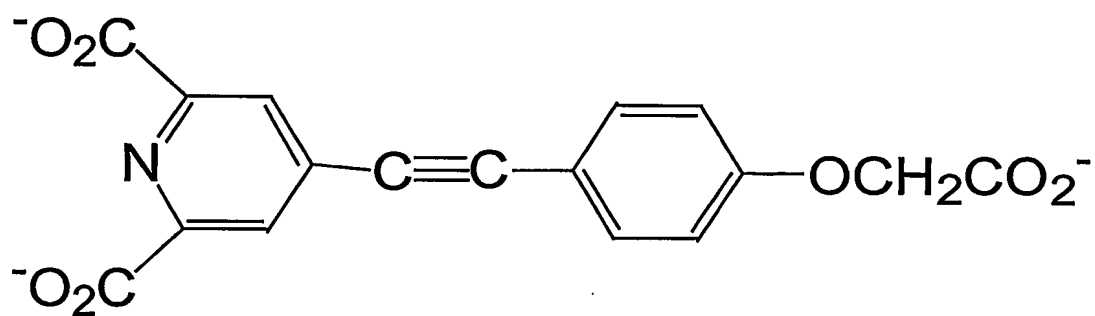


Figure 3

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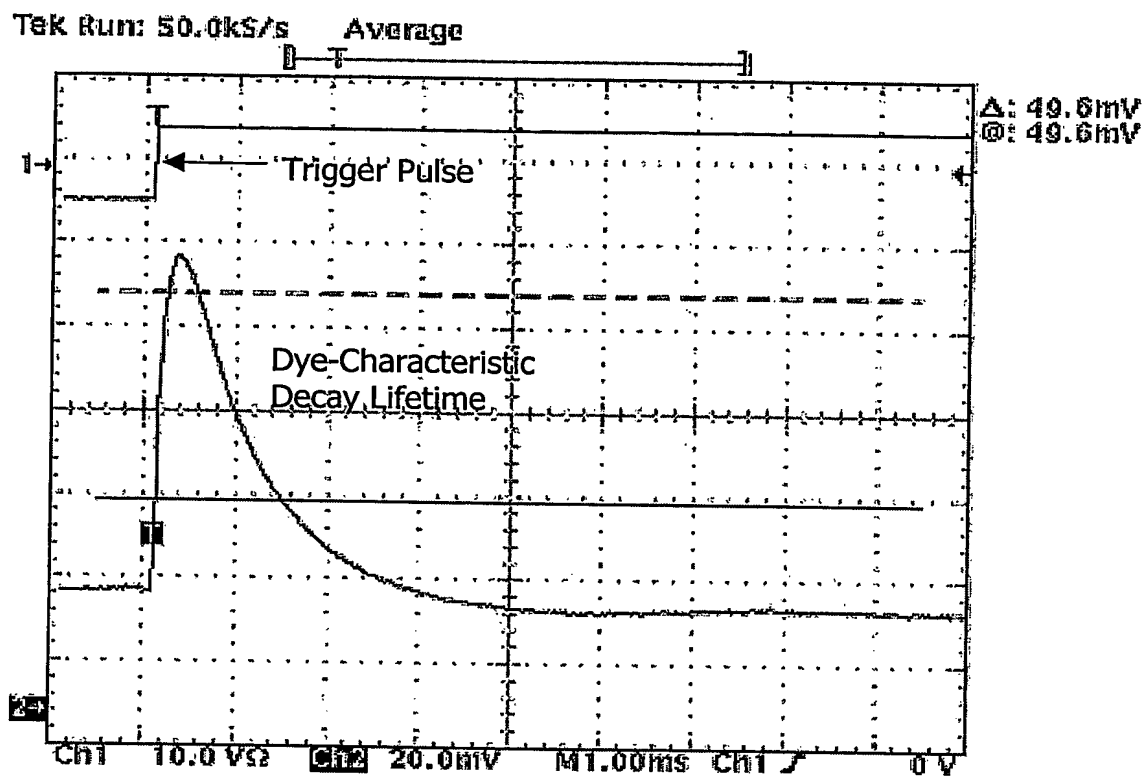
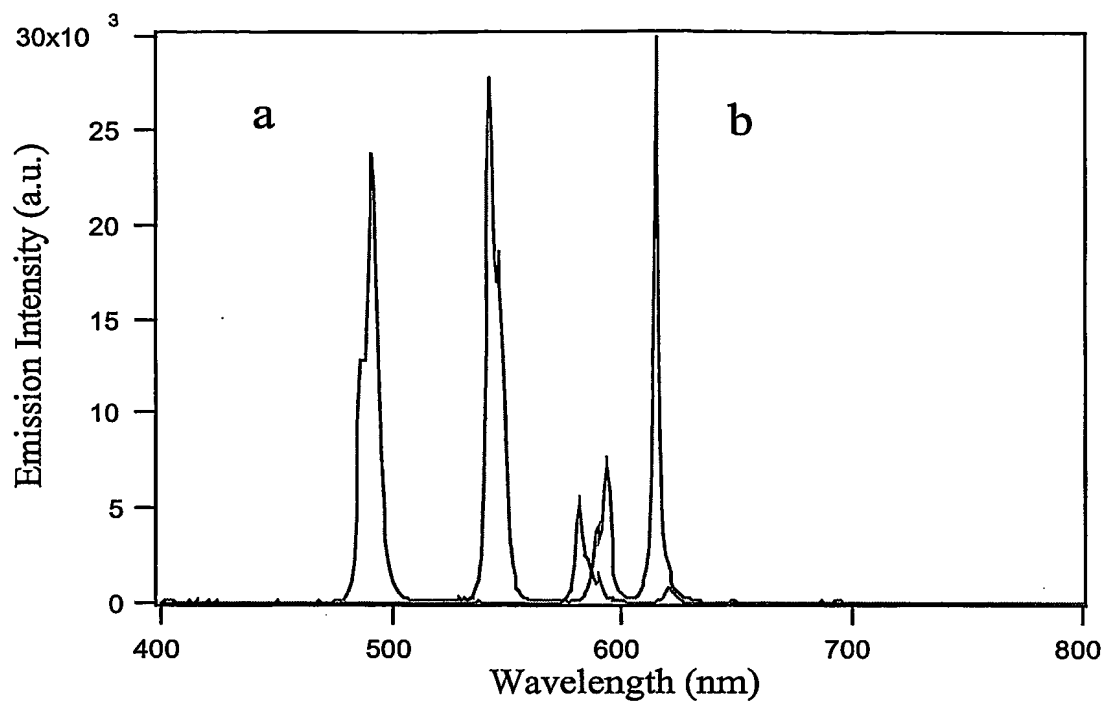


Figure 4

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**Figure 5**

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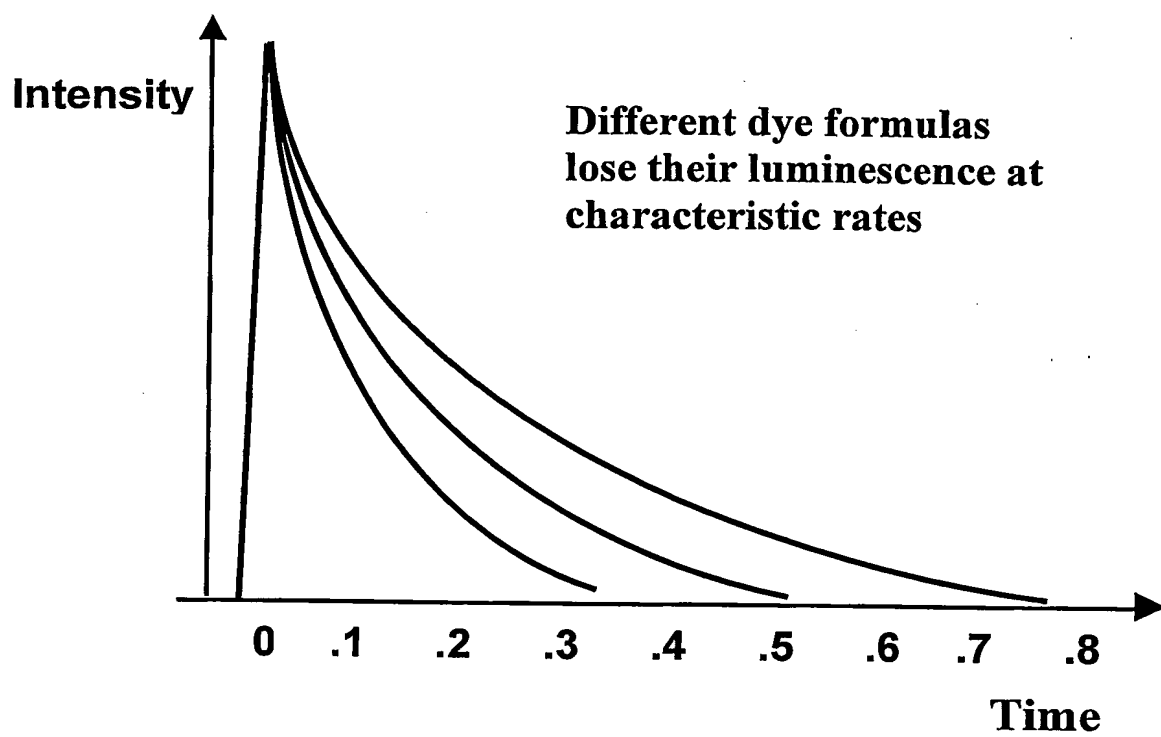
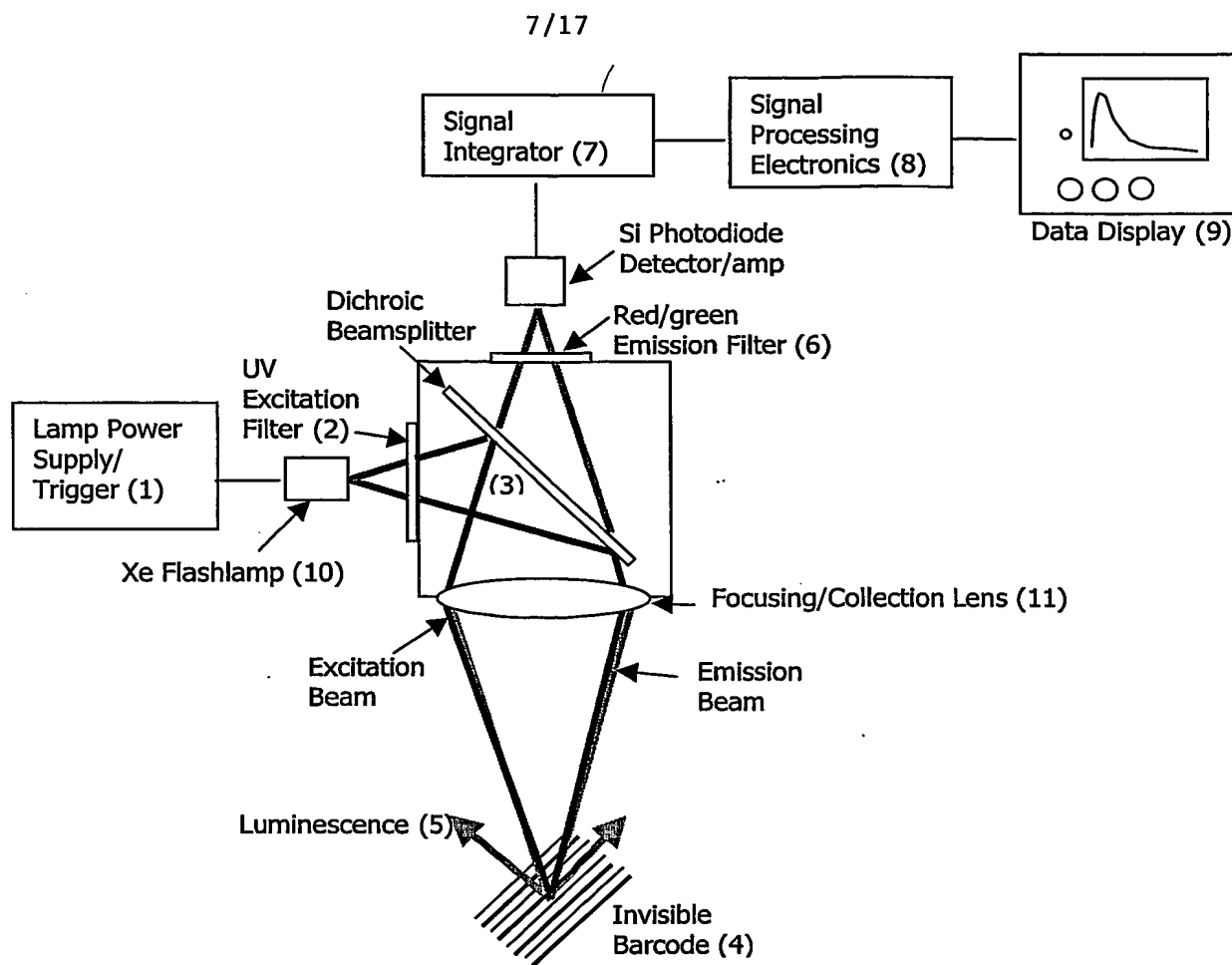
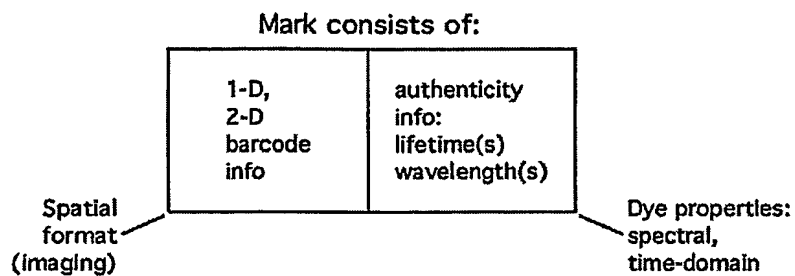
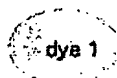
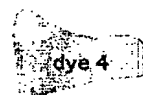
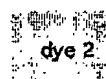
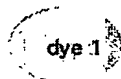
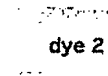
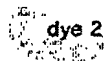
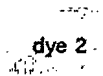
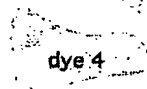
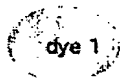


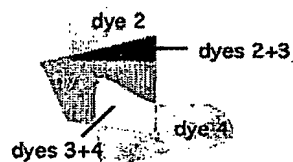
Figure 6

**Figure 7**

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Discrete
MarkDiscrete
Marks (1-D)Discrete
Marks (1-D)Discrete
Marks (2-D)Overlapping
Marks

dyes 1+2



dyes 2+3

dyes 3+4

Figure 8

System Operation

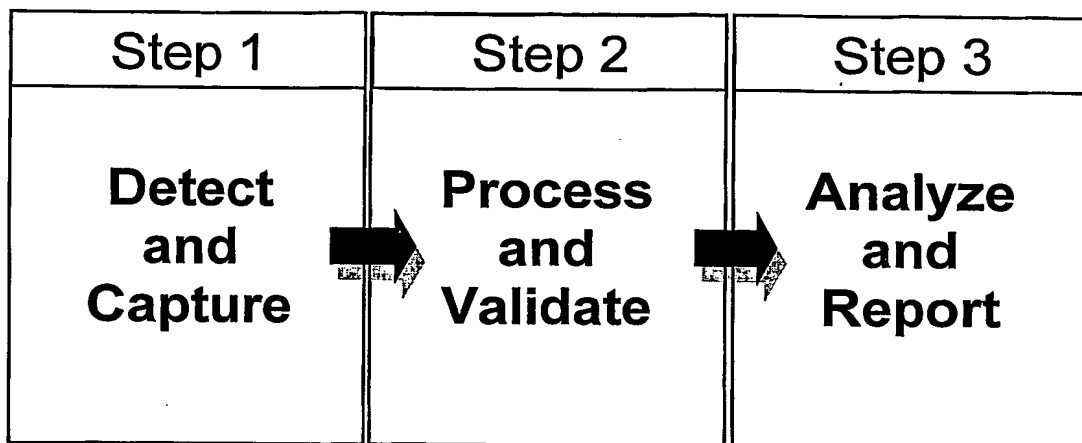


Figure 9A

Step 2 Process and Validate

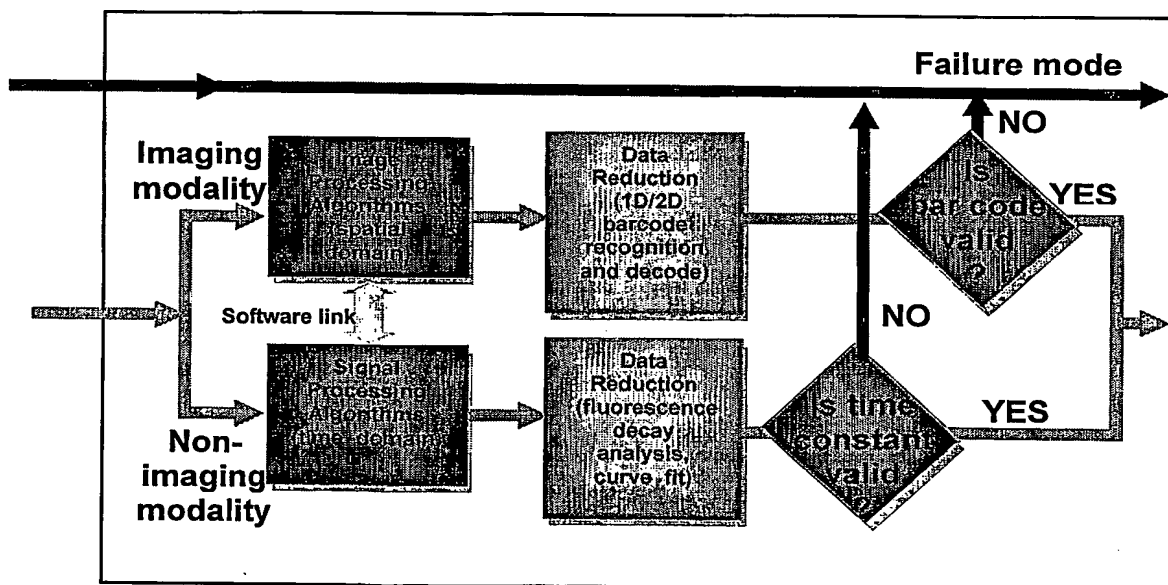
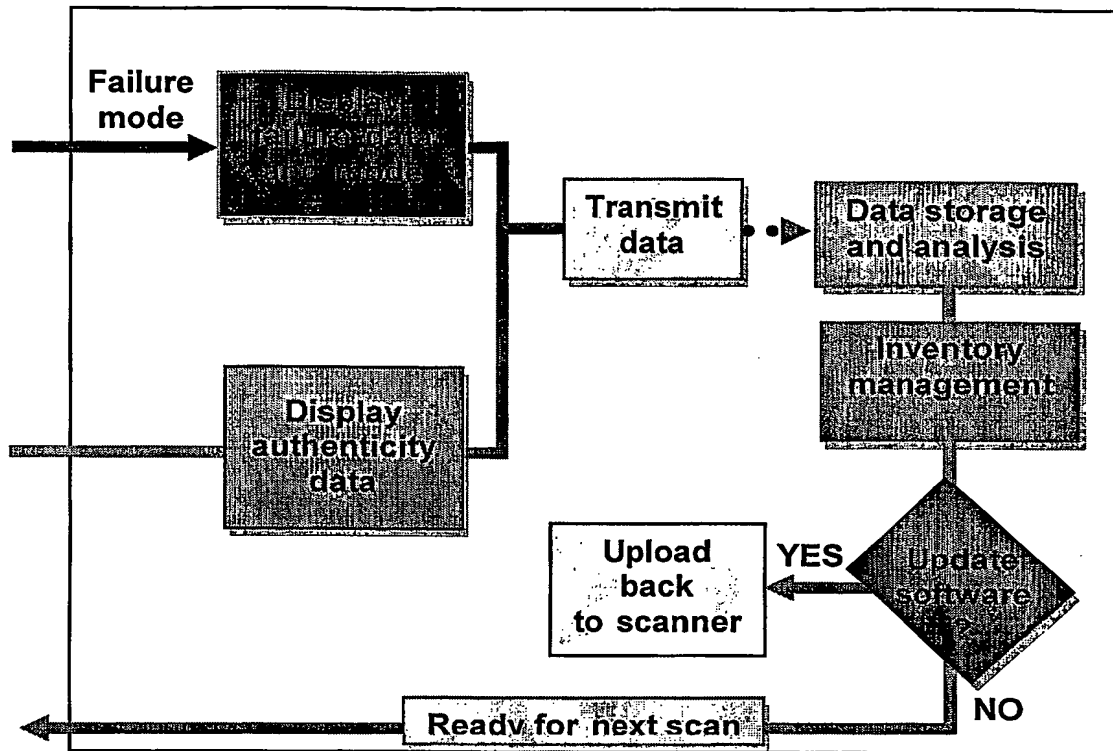


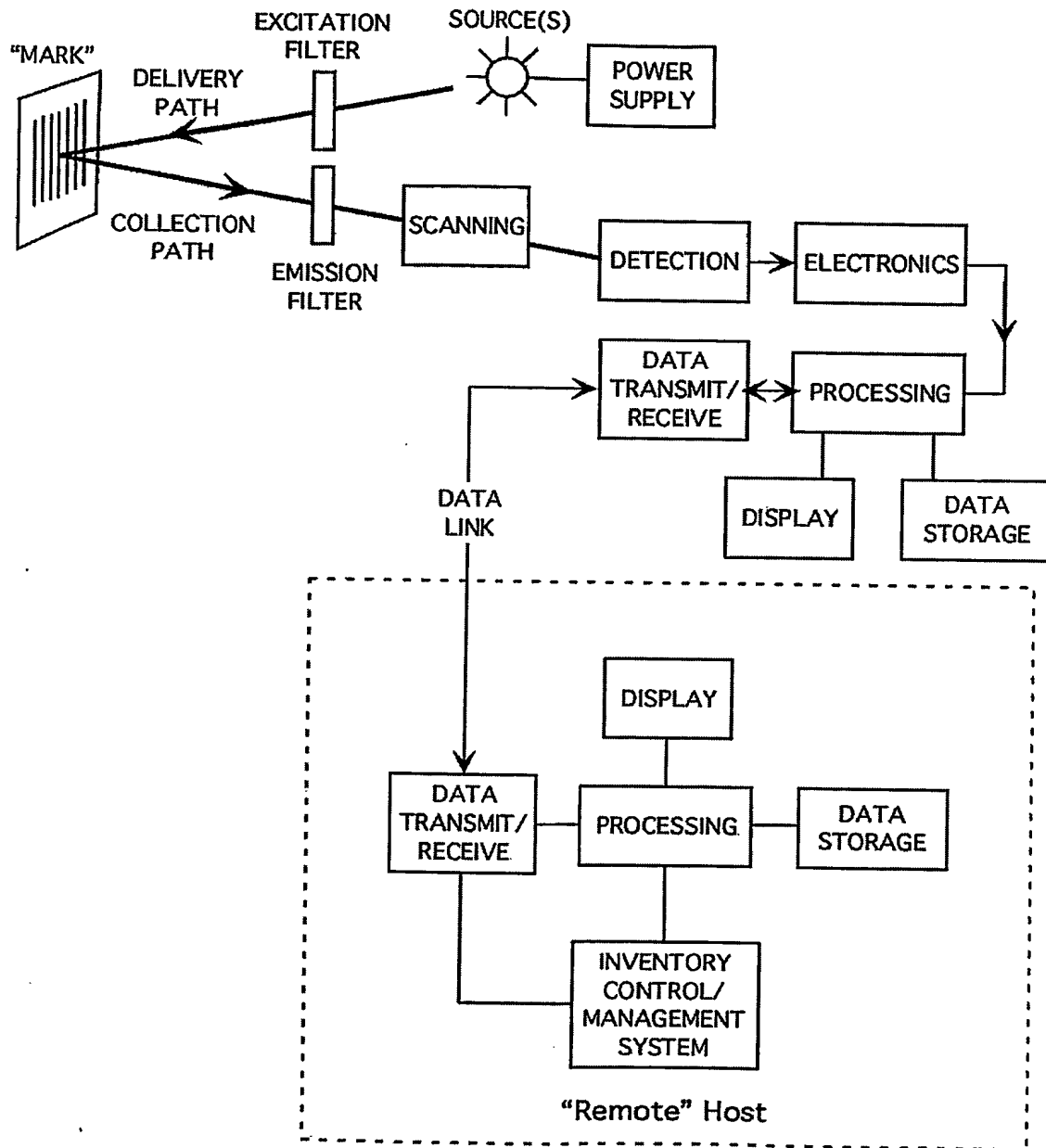
Figure 9B

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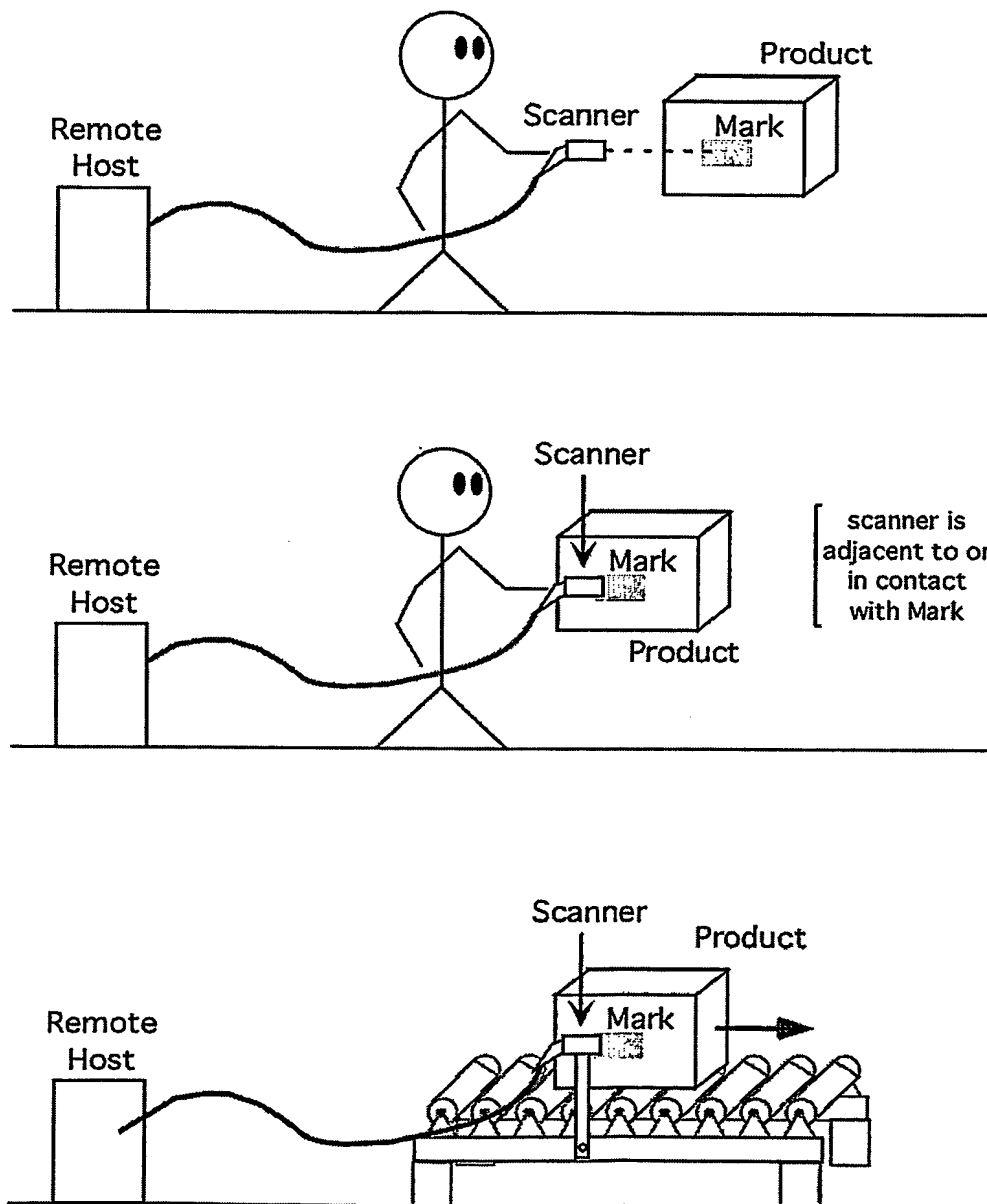
Step 3 Analyze and Report

**Figure 10**

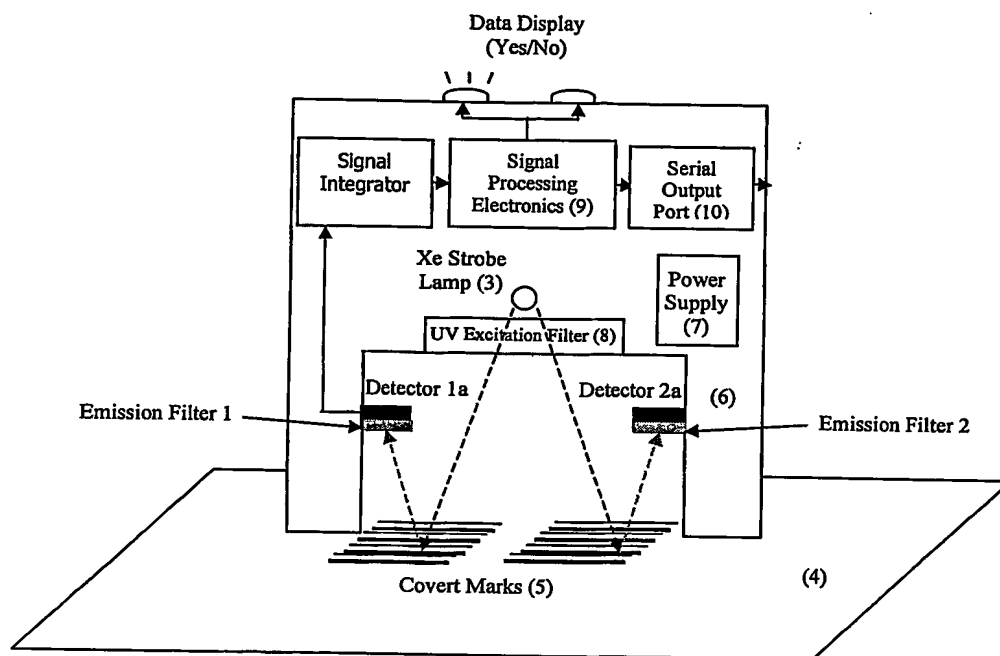
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**Figure 11**

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**Figure 12**

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**Figure 13**

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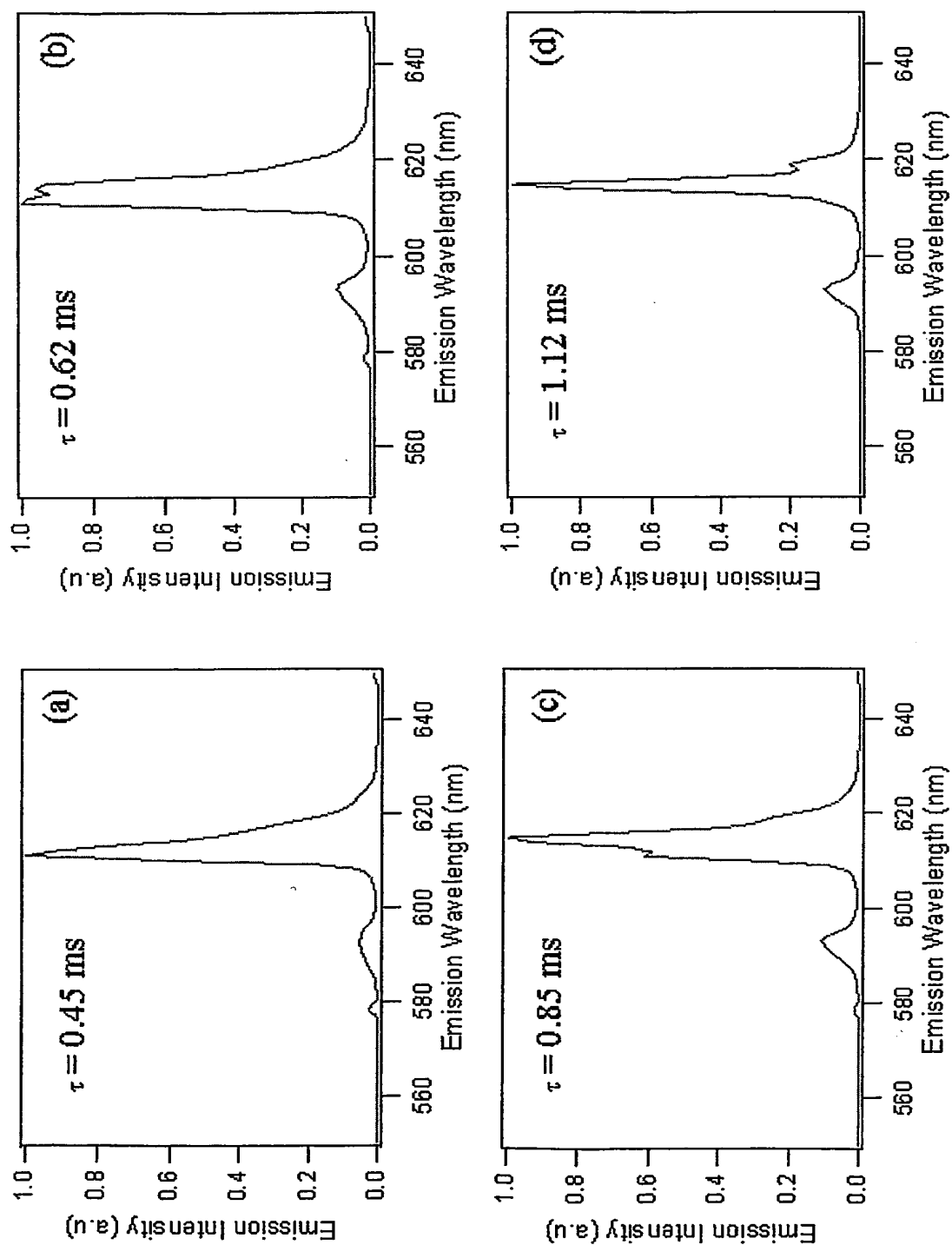
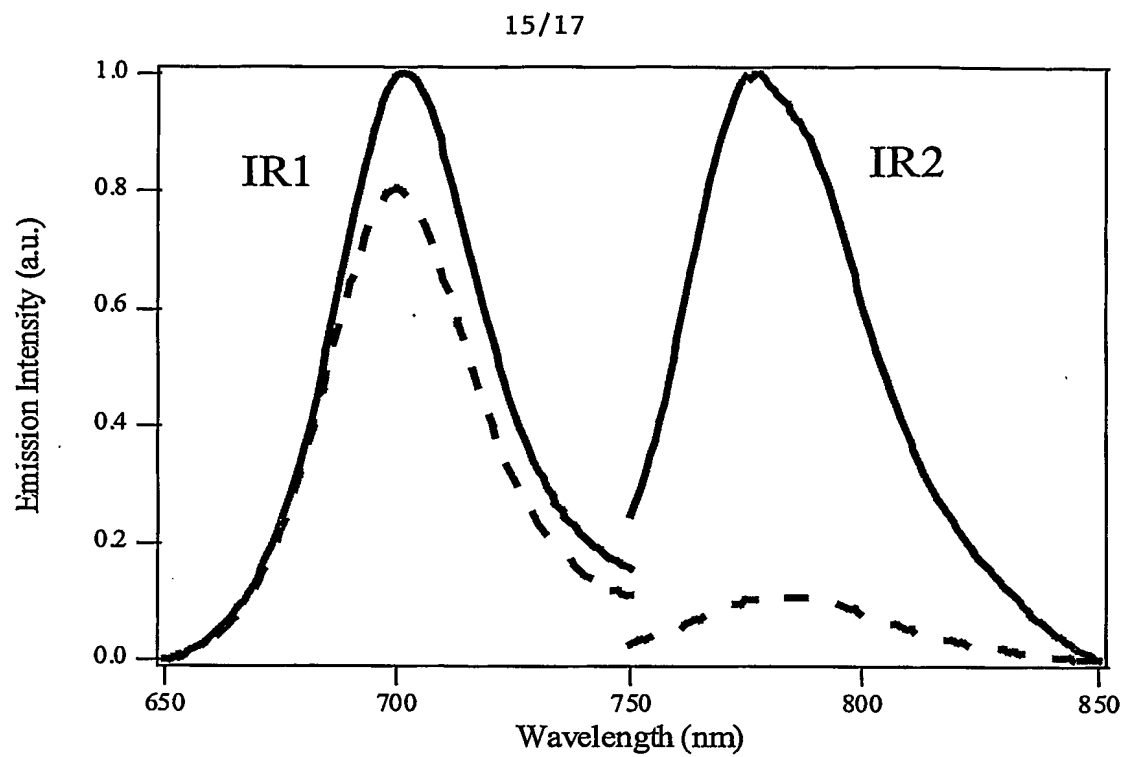


Figure 14

**Figure 15**

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Table 1 Absorption and luminescence parameters for europium chelates ^a

<i>Chelates</i>	λ_{max} (abs)	ϵ_{max}	λ_{max} (lum)	τ_{lum}
1	308 nm	17400	615 nm	0.97 ms
2	326 nm	16600	615 nm	1.02 ms
3	317 nm	17200	614 nm	1.01 ms
4	337 nm	19300	615 nm	0.97 ms
5	339 nm	26000	614 nm	0.36 ms
6	352 nm	24200	615 nm	0.43 ms

a, Aerated water solutions, pH 8.5; [chelate] = 40 μM ; $\lambda_{\text{exc.}}$ @ 337 nm for lifetime τ_{lum} measurements; τ_{lum} recorded by monitoring emission at 615 nm.

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Table 2 Luminescence lifetime data for chelates

Chelate	Modifiers ^a			
	None	Imidazole	4-MI	IDA
1	0.97 ms	1.19 ms	1.22 ms	0.45 ms
2	1.02 ms	1.21 ms	1.37 ms	0.48 ms
3	1.01 ms	1.23 ms	1.19 ms	0.46 ms
4	0.97 ms	1.27 ms	2.03 ms	0.60 ms
5	0.36 ms	0.65 ms	0.54 ms	0.50 ms

a, Modifiers at 1.0 mM concentration; Imidazole, 4-methylimidazole (4-MI), and iminodiacetic acid (IDA), were added to an application medium of 200 μ M chelate in water (pH9.0) and applied to plain paper; lifetimes (units of ms) from exponential luminescence decay curves ($\lambda_{\text{exc}} = 337$ nm; $\lambda_{\text{lum}} = 615$).

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